THEORY OF STORMS. [FROM OUR OWN CORRESPONDENT.]

WASHINGTON, July 7 .- I have discovered the "Clerk of the Weather." Unlike his illustrious predecessor in office (who, I think, must have served under one of the early Administrations, as it is only a few months ago that an officer of the army was assigned to this duty, and a careful search through the late reports of the Smithsonian Institution fails to disclose the name of Prof. Æolus). No longer

- celad sedet Molus arce, Sceptra tenena,"

though he still -- mollitque animos et temperat iras

of the " Luctantes ventos, tempestalesque sonoras.

Having received my impressions concerning the office and the manner of conducting business there from the report of Mrs. Jupiter's famous visit, from which these extracts are made, I was not at all prepared for the cordial reception I received, nor to find that so great revelutions had taken place and so many improvements had been made since that report was first printed. Instead of a " vast cave " within which the winds and storms are confined, bound down with chains, and held in subjection by the "weight of lefty mountains piled upon them," I found an ordinary three-story brick dwelling, on the flat roof of which had been built a sort of Summer house, supporting on its top certain black, odd-looking machines—immense weather-cocks, curious wind-mills with little cups on the ends of their long, slender arms, and flaring funnels, such as may be seen around a stillhouse or a corner grocery, except that these were larger. From an upper corner window issued a dozen telegraph wires, which, having crossed the street, separated and took diverse directions. No loud complaints nor deafening roar of imprisoned winds issued from bolted and barred iron doors, but the entrance stood invitingly

THE INTERIOR.

Within everything was as mysteriously plain and common-place. A parlor has been converted into an office by the introduction of two or three desks, at which sat as many gentlemen engaged in writing. Some curiously wrought implements standing in one corner alone sug gested the character of the place. Nor was the presence of the clerk himself any more imposing. A room which, with its books and tables, bad nothing to distinguish it from a thou-and other Government offices in this city, was occupied by a quiet, gentlemanly officer of the army, to whom I was presented. Gen. Myer, the Chief Signal Officer, sits on no "high throne" and bears aloft no "scepter," and yet his command over the winds and waves is as much greater than that of his predecessor in office, with all his blustering fuss and show, as his manners are gentler than those of . Folus were.

There is nothing of mystery about the Chief Signal Office when once you are in. Visitors are cordially welcomed and accompanied by gentlemanly officers co ducted to every department where all the instruments are carefully explained and questions cheerfully auswered. The business of every signal station in the country as well as of the central station in Washington is divided into two branches, the making of observations to send to all of the other stations, and the reception of reports and the publication of them for the public use, liesides this, in the office here the reports, as they are received, are arranged so that they may be scientifically examined and deductions made.

THE INSTRUMENTS-THE BAROMETER. First of all, the observations must be made. The in struments used are a barometer, thermometer, vane, nometer (an instrument for measuring the velocity and force of the wind), rain-gauge, and hygrometer, an instrument for measuring the humidity of the atmosphere. The barometers issued to the observers are superior instruments of the ordinary form; they are carefully compared with the standard in the Washington office, and the instrumental error ascertained. All readings of the barometer taken for telegraphic transmission are corrected by the observer for temperature, elevation, and instrumental error. Careful instructions are also given as to the location of the instrument and the method of making observations. A number of self-registering barometers are on trial at the central office here. Though varying greatly in construction they are nearly the same in principle. The essential parts are a syphon barometer float on the surface of the mercury in the short leg of the tube. To this is attached, by means of mechan ism more or less complex, a pencil or pointed piece of steel which marks upon a card, either by means of a co tinuous line, or by dots or little holes, the exact hight of the mercury during each of the twenty-four hours. A lock, attached, moves the card along so that its whole length passes the pencil once in twenty-four hours. In some of the instruments the card is placed on a cylinder which revolves once a day, and in others the marks are made by means of an electric battery.

The reading of the barometer, and also of the wet and dry bulb thermometers, is registered by means of photography. A piece of glass is prepared and placed frame in the camers, the frame being drawn by clock-work, so that the whole length of the glass passes a given point once a day. Before the glass is placed a board with three long, narrow penings in it. Before the first of the barometer, in such a position that the surface of the mercury is a little below the center of the glass. A little further along is placed the wet-bulb thermometer, and lastly the dry-bulb one. Behind the instruments is placed a lamp. As the glass is drawn along, the light through the openings acts upon the sensitive surface of the glass; but as the lower part of each opening is closed by the mercury in the instruments, their length, as shown on the "negative," constantly varies, each change being distinctly photographed. This process, though successful, was not tried until February last, and is probably susceptible of much improvement. The thly records of each self-registering instrument are bound together and preserved for reference.

THERMOMETERS.

The thermometers used are ordinary, standard lostru ments, carefully corrected by comparison with that from which the record is made here. Observer sergeants are also supplied with thermometers, which register the highest and lowest readings of the day. They are of the ordinary kind, one filled with mercury, on the surface of which is placed a bit of metal; as the mercury rises it shes this index before it, but on falling, leaves it at the highest point; the other is filled with alcohol, and the index in this is made of porcelain. As the liquid re cedes, the index is drawn along by means of the attraction between them, but when it rises, it passes the index leaving it at the lowest point. Each day the index is placed on the surface of the mercury or alcohol, the one by means of a magnet, and the other by raising one end

of the instrument. The hygrometer consists of two thermometers placed opposite each other on the same frame. The bulb of one is covered with muslin, and is connected with a little cistern of water below by means of some bits of cotton yarn. The water is thus raised by means of capillary attraction so that the bulb is always wet. The rapidity with which evaporation takes place from the muslin on the bulb is indicated by the different readings of the two thermometers, and the amount of moisture in the air is computed from this by the aid of tables prepared by Guyot. A very ingenious little instrument which obvi ates the necessity of making computations is now on trial at the central office, with such good results that duplicates of it will probably be issued to all the observation stations. The two thermometers are placed on the same frame, and between them is fixed an index; a small index, connected with the large one in the center also slides on the tube of each thermometer. When the small indices are so placed as to indicate the correct reading of the thermometers, the large index points to figures showing the percentage of moisture which the ntmosphere contains.

ANEMOMETERS. The anemometer consists of four small iron hemispheres attached to the ends of two iron rods, which cross each other at right angles in the center. As these turn, they communicate with four dials similar to those in a common gas-meter, and from which the distance trav eled by the wind since the last observation is read. To find the pressure of the wind from its velocity, the fol-dowing table has been prepared:

| Howing tuble line been prepared:
| Velocity, Pres're, Velocity, Pres're, Velocity, Pres're, Velocity, Pres're, Velocity, Pres're, Velocity, Pres're, Velocity, Indiana, Indi 6,84 7,22 7,60 8,00 8,40 8,83 9,24 9,63 10,12 1.12 The self-registering anemometer, by a contrivance

somewhat similar to that employed in the self-register ing barometer, make a record of the velocity and pres sure of the wind for every minute of time.

WIND-VANES AND RAIN-GAUGES. The wind-vanes used by the signal officers are made of sheet-iron, and are arrow-shaped. The direction of the | 75, 89 and 94. No system of warning signals for ship-

wind as shown by these is recorded by the observers by careful examination of the vane. A self-registering

The rain-gauge consists of a cylinder with a funnel shaped top, the area of the end of the funnel being ten times as great as that of one end of the cylinder. A measuring-rod accompanies each, ten tuches on the rod denoting one inch of rain-fall. The self-registering raingauge is one of the most ingenious instruments to be seen in the office of the Chief Signal Officer. The cylinder in which the rain fails is placed on the roof, and connects with the instrument by means of a tube, which conducts the water into a glass receiver. This is suspended within a larger receiver, and is connected by means of complex mechanism with a pencil, the point of which is placed against a card, which is at the same time drawn along by being attached to a clock so that the whole card is drawn past the pencil once a day. The hours are marked on the card by lines drawn across it from top to bottom. As the receiver fills with water it slewly falls, bringing the pencil down at the same time. When half an inch of rain has fallen, the pencil has reached the bottom of the paper, and the receiver empties itself by means of a syphon, at the same time rising to the top and taking the pencil with it. This instrument is so delicate that it

registers the thousandth of an inch of rain. THE OBSERVER SERGEANTS-THEIR REPORTS. Having been supplied with these instruments (the ordi nary, not self-registering,) and having been instructed in the use and care of them at ithe school established for that purpose at Fort Whipple (opposite Washington, on the Virginia side of the Potemac), and having passed his examination satisfactorily, the observer sergeant is ordered to his station. He immediately procures a room in the upper story of a building, with windows facing north, and near the telegraph office which is to receive and transmit his reports. He immediately sets up his instruments and furnishes his office, and then reports to the office at Washington that he is ready to begin observa tions. Six observations are made each day at each station, three to be telegraphed and three to be sent to the Washington office by mail. Those to be telegraphed are taken simultaneously by all of observers at 8 o'clock a. m., 4:30 p. m., and mid-night, Washington time. Those to be transmitted by mail are made at 7 o'clock a. m., and 2 and 9 p. m., local time. The merning report, which is the most complete, is taken in the following manner: First, the hight of the barometer is taken, and, after correction for elevation and temperature, noted in hundredths of inches; the the reading of the exposed thermometer, the relative humidity and the direction of the wind; after this, the velocity of the wind is recorded, and then the state of the weather, "clear," "fair," "light rain," "heavy rain," snow" or "hail," &c. In this report the amount and kind of upper and lower clouds are also given, and the amount of rain-fall during the past 24 hours. This entire report, by the use of figures, is transmitted with only 20 words of telegraphing, and from it the elaborate reports furnished to the press are made out. The following is a specimen of the morning report, as made out at each station, and telegraphed to every other one of the 50:

> 70281 1 2 1 5 3

The first three figures in the first line show the reading of the barometer in thousandths of inches, and written in full would be, "Barometer, 23.447 inches." The last two figures in the same line show the number of the station, No. 26 being at Montgomery, Ala. In the second line, the first two figures show the hight of the exposed therneter, and written in full would read, "Thermometer, 70°;" the next two show the relative humidity of the atmostphere, it being in this case 28 per cent of saturation. The last figure shows the direction of the wind, north being represented by one, north-east by two, east by three, &c. In the third line, the first two figures show the velocity of the wind, the next two the day o the month on which the report was made, and the last the state of the weather-zero indicating clear weather; one, fair; two, cloudy; three, clearing up The first figure storm, &c. after a the last line shows the amount and kind of upper clouds, zero indicating a clear sky; one a hazy atmosphere; two sky i to i; and three, ito4-4 covered with cirrus clouds; four, sky i to i, and five, i to 4-4 covered with cumulus clouds. The word "blank" denotes that the upper clouds are hidden. The second space in the ast line shows, by a similar arrangement, the amount and kind of lower clouds, and, in the example taken means that the sky was from I to entirely covered with stratus clouds. The last three figures show the amount of rain-fall during the past 24 hours in inches and hundredths of an inch. The afternoon and night re-ports are made by the use of 10 words represented by figures as in the morning report. The Government pays to the Western Union Telegraph Company two cents : word for each circuit over which the message passes, and the yearly expense is about \$65,000. The weather reports have precedence of all other messages until they are complete. The operator in Gen. Myer's office here is on three circuits, one to New-York, one to Chicago, and one to New-Orleans.

SOWING THE INFORMATION BROADCAST-STORMS. As soon as the reports are received, they are translated nto ordinary language and manifolded for the press. The familiar bulletin-sheet is then filled out and posted in the rooms of Boards of Trade, Chambers of Com-merce, and other conspicuous places. The manifold maps are then printed and distributed, and, lastly, the "War Weather Map" is changed. As these each contain an explanation, it is not necessary to repeat it

Having received the reports, they are given to Prof. Abbe, the meteorologist of the Signal Corps, who at once transfers them to a map, in order to see at a glance the exact condition of the atmosphere in every part of the country, and what changes have taken place since the last report. He then makes out a synopsis of the weather during the last 24 hours, and prepares his predictions. In order to understand how these predictions are made, it is necessary to refer briefly to the generally received theory of storms. It is well known that there are, in the tropies, constant winds that, with little variation, blow me direction during the whole year. Those outh of the equator are the more powerful, blow toward the north-west, and are known as the "south-east trade winds;" and those north of the equator blow toward the outh-west, and are called the "north-east tradewinds." Between the two there is a narrow belt of equatorial calms and rains. Now it is evident that the south-east trade-winds should at any reach north of the equator, there come in contact with the north-east wind, the most natural result (would be a rotary motion of the wind, turning in the direction opposite to that of the hands of a clock, and moving in a north-west direction. In this way, it is supposed, the cyclones of the West Indies are formed. On reaching the Gulf Stream they take the course of that great ocean current and are finally lost in the ocean. But, sometimes, it is supposed, smaller storm is thrown off from the large cyclone, which, taking a westerly direction, passes through the Gulf of Mexico and strikes the coast of Texas, or first reaches land on the south-eastern coast of the United States. It has also been proved that the air which the trade-winds bring to the equator rises there to great altitudes and flows back to the poles. Now if these winds in the northern hemisphere meet the colder cur rents from the pole, the result would naturally be a uld first show itself in the north-western part of the continent, and having crossed the Rocky Mountains would move across the United States in an easterly or south-easterly direction. The observations of the Signal Corps, thus far, seem to confirm these theories, the severe storms that have occurred during the past Winter and Spring having been first observed in the south-west, north-west, or on the eastern coast of the Southern States, and the wind at various stations on the out-skirts of the storm blowing in a circle, the centre of which was the point of lowest barometrical

TRACKING A STORM-WARNINGS OF ITS APPROACH. Prof. Abbe having, therefore, marked his map accord ing to the report, connects by lines those places at which the barometer stands at the same hight. These isobarometric lines are generally found to form circles, ovals, or arcs of these figures, and in the region of lowest pressure (if the barometer stands very low there) a storm is generally reported. The next report is likely to show that the region of lowest pressure has moved toward the east, north-east, or south-east, its direction being in great measure determined by the mountain ranges, rivers, the temperature of different parts of the country, and various local causes. The direction and rate at which the storm has moved since the last report, with the consideration of local influences which are likely to affect it, form, then, the basis for a prediction If, for instance, a storm which has moved in a northeasterly direction 300 miles during the last eight nours is now in Indiana and Illinois, within 300 miles of the lakes, it is safe to predict that it will reach their shores within the next eight hours, and to warn shipmasters and others to prepare for it. It will thus be seen that the "probabilities" as published every day are no ses, but are founded on the best of data, and wild ones may, therefore, be read with a great degree of confidence. The United States are far more favorably situated for the observation of coming storms than any European country, and yet the records show that in England

73 per cent of the storm warnings have proved correct,

while in France the percentage has been as high as 71,

masters and farmers has yet been adopted in this country, though the subject is now under consideration.

The predictions made by Prof. Abbe, all relate

storms of a general nature, and not to local disturbances, such as thunder-showers, &c., which, though they may affect the course of a storm, generally extend over small areas. Warnings of these might be given from one station to another, though as yet no arrangements for such warnings have been made. Gen. Myer has only just begun his work, the reporting of the weather having been assigned to the Signal Corps only last November, but not only the possibility, but the great advantages of reporting the approach of storms have already been emonstrated, and there can be no doubt that this division of the War Department will rapidly develop, until, In time of peace, it will be the most important in its practical results of all the bureaus in that Department, The officers now on duty at the office in this city are Gen. Myer, Chief Signal Officer; Lieut.-Col. Maliery, who has charge of orders, records, and general corresp Major Norton, Property and Disbursing Officer; Capt. H. W. Howgate, Instructor and General Supervisor of Observer Sergeants on stations and of the receipt and publication of reports; Prof. Cleveland Abbe, Meteorolo-

THE STATE REWARD FOR A MOTOR FOR CANAL-BOATS.

To the Editor of The Tribune

SIR: The Eric Canal was not constructed until after free discussion and the opponents of the measure nad been fairly vanquished in argument. It required many speeches by Gov. Clinton and his friends to convince their fellow-citizens of the truth of their poitions, and even then the people of the State of New-York for a long while hesitated to authorize the expenditure of such large sums of money as the enterprise denanded. To-day, the commercial prosperity of New-York City is to be attributed to the foresight of De Witt linton and the projectors of the Eric Canal. But this is the day of rapid transit, and the Eric Canal must be put in a position to compete with railroads. To do this successfully, steam must be introduced; and how it shall be done to double the present rate of speed, and not wash the banks, is the problem of the hour. As one of the means of solving this problem, the following bill has

means of solving this problem, the following bill has been passed by the Lexislature:

Section I. George B. McClellar, Horatic Sermont, Erastas S. Prasser, David Dowa, George tredles, Van R. Hichmood, Willis S. Selson, George W. Chapman, William Van R. Hichmood, Willis S. Selson, George W. Chapman, William Van Herbert and George W. Chapman, William van Jerstein den D. Pay are hereby appointed a Commission to practically test and examine inventions, or any and all derices which may be submitted to them for that purpose, by which stem, caloric, electricity, or any other motor than animal power, may be practically and profitably used and applied in the propulsion of boats upon the canals; said examination and tests shall be had by the said Commissioners at such time or times during the season of canal navigation for the years 1871 and 1871, as they any order and direct; said Commissioners shall have the right, and they are hereby expressly required, to reject all such invanitions or devices, if in their opinion none of the said inventions or devices shall fully and assisfactorily meet the requirements of this set; but said Commissioners shall demand and require: First: The inventions or devices shall fully and assisfactorily meet the requirements of the set; but said Commissioners shall demand and require: First: The inventions or devices to be tested and tried at their own proper costs and charges of the parties offering the same for trial. Second: That the best shall, in addition to the weight of machinery and fuel reasonably necessary for the propulsion of said boat, he enabled to transport, and shall actually transport, on the Krie Canal, on a best or trial eribition, under the rules and regulations now governing the boats navigating the canals, at least 200 times of cargo. Third: That the simplicity economy, and darability of the canals or their structures. Fourth: That the boat can be readily adjusted to the invention, device, or improvement can be readily adjusted to the present canal-boats; and, lastly, th been passed by the Legislature :

2. No such test shall be made if the same shall in any manner to inder, or delay the passage of boats navigating the canals und

aforeasid, but not to exceed three in number, shall be in all respects full and astifactory, practical and profitable adoptation to the wants the canals by reason of a new, useful, and economical means of propuls of for boats within the meaning of this act, it shall then, and not other wise, be their daty to grant unto the owner or owners of sun inventions or devices, his or their attoracy, their certificate certificates under their hands as such Commissioners, that the hare so detercined and adjudged to the owner owners of the invention or device which, in the judgment of the sax Commissioners, possesses such the grantest degree of perfection the requisit s, possesses in the greatest degree of perfection the requisite the first section, they shall grant a certificate, which shall Jerrificate No. 1; and to the owner or owners of the nex degree they shall grant a certificate as a foresaid, which is as Certificate No. 2; and to the owner or owners of the

many cases in Sections: to the Governor.

The reasonable expenses of the said Commission, not excee the said of \$\frac{1}{2}\$, \$\frac{1}{2}\$,

a. 7. If on or before the first day of November, 1973, the Commits bereinbefore named abil, upon due examination, find and detect that the sald invention or device has been successfully operated upstands, and has been or will be largely adopted as a motor on as, by reason of its superiority over any other known method vision, then and in such case they shall grant a further certificate fact, and the Controller, upon its presentation to him, shall draw hat upon the Treasurer of the State for the further sum of \$50,00 ble to the said owner or owners of the said device, his or their r, out of any money in the Treasury not otherwise appropriate in case of the granting by said Commissioners of more than of facts, as stated in section six of this act, then and in that case of \$50,000, mentioned in this section, shall be divided among a to the owners of the said certificates in the proportion and in the as stated in section six of this set.

To accomplish the object of the bill it is necessary first to satisfy the community that the trial will be fairly and honorably conducted, and that the award of the Commission will be made entirely on merit, as it complies with the requirements laid down in the bill. An exami nation of the sixth requirement discloses the surprising fact that the Belgian system is specially, by name, excluded from competition. This is the more remarkable when it is known that this plan is the only one which has been thoroughly tried in Europe, and which has received the approval of many of the first European engineers. It has been adopted by several canal companies in France, Belgium, and Holland. As a result, the cost per tun per mile for carrying goods has been acourately determined, which is not, I believe, the case with any other system. Therefore, an explanation should be made as to the cause for so carefully excluding this sys tem by law from the proposed trial by the New-York

State Commission. At the experiments which were made in Belgium, the Governments of England, France, Prussia, Austria, Wurtemberg, Holland, and Belgium, sent special engineers; the Suez Canal Company and steam navigation compa nies from the Danube, the Elbe, the Rhine, and the Rhone were represented. In our own country, one o the largest coal-mining and carrying companies have ex perimented with this system on their own line, and another is now contemplating the introduction of it in its works. I am aware that the topographical character of our State is somewhat different from that of the continental States which have adopted the Belgian system : but certain modifications might be introduced by which that system might be applied to the Eric Canal, if the very terms of the bill did not prevent inventors from taking the subject into consideration. Then, again, to many minds a traction-engine on the banks of the canal seems to be a most natural substitute for the horse-power now in use. But the bill does not permit the Commissioners to examine into this question. I will not here discuss the difficulties or objections to these ideas, but I do insist on the right of those who entertain them to a full and impartial hearing. The friends of the nar

but I do insist on the right of those who entertain them to a full and impartial hearing. The friends of the narrow gauge railread on the tow-path, with their locomotive engine as a towing-power, are likewise debarred from being heard.

To speak plainly, inventors think they perceive a political job, and many of them have determined not to compete for the \$100,000 at all. They say the trial will not be conclusive, nor will the field of investigation be sufficiently broad. I do not know what the framers of the bill had in view, but the tax-payers of the State, who have realized the necessity of improving our inland navigation, want a full, fair, and competitive examination of all systems or devices for the purpose. The friends of the bill point to the very prominent gentlemen named as Commissioners, and notably to George B. McCiellan and Horatio Seymour. But it is not known that these gentlemen will serve, in fact it is more than hinted that they will not serve. This may be also said of some other members of the Commission whose names were included to guarantee the measure. In case these members decline to serve, the bill provides that any vacancy "may be filled, on application of the remaining Commissioners, by the Governor." Will this be satisfactory to the public! The importance of this subject to the State, and the desire from all quarters that this trial should decide the question, or at least take a step toward a decision, makes it necessary, above all things, that this competition should be free, and that no favoritism or any other motive than justice and the public good should influence a decision. The people of this State are not the only one interpsted in this award of the commission, but from one end of the country to the other, public attention has been groused, and awaits with impatience the results of the trial. The managers of inland navigation companies in Europe are also looking forward to the experiments in New-York with the same interest that we did to the trial of the Belgian system in Europe

New-York, July 9, 187L

THE GERMAN NAVY.

ITS FORMER AND PRESENT CONDITION-THE SYS-TEM OF NAVAL INSTRUCTION—HOW THE OFFICERS AND SEAMEN OF THE NAVY ARE OBTAINED. [FROM OUR SPECIAL CORRESPONDENT.]

WILHELMSHAVEN, June 24 .- In the year 1847,

there was a Germany after a fashion, but that Germany had no fleet, or any notion of a fleet. In the year 1848, there were ideas of a German Empire, to be constituted in some revolutionary fashion or other by a constituting Parliament sitting at Frankfort-on-the-Main. It seemed good unto this inchoate Empire that it should have a fleet; the suggestion being owing chiefly to a Radical member named Kerst, who had first been a schoolmaster, and then lived for a long time in Brazil. A fleet of some kind was got together-if a curious collection of "cast" crafts from other navies could be called a fleet-and then came the question about a port on the North Sea, for any port on the Baltic obviously had its disadvantages. A committee was dele gated, with the right of secret sittings, to inquire into the capabilities of certain localities for havens, Kerst being the moving power in the matter. While the Committee was deliberating, and had almost concluded a provisional bargain with the Grand Duke of Oldenburg for Wilhelmshaven, there came a crisis in the affairs of this problematical German Empire. Its fleet was put up to auction. What came of the offal it is not easy now to discover; the ships that least merited breaking up were bought at auction by Prussia. Prussia, too, assumed the Wilhelmshaven negotiation, and concluded it in the year 1853, buying from Grand Duke Peter a slip of bulrush waste land, measuring about 3,150 acres extending from the Banter Creek on the south to Heppensertrift on the north, for the sum of \$375,000-a purchase not profitable on the face of it, but made with the view of converting the bulrush waste into a great naval port and arsenal. Since the the boundary of 1853 has been extended some little distance inland. The construction of the war haven was ommenced in the year 1851, but was proceeded with in a very languid manner for several years. The annual sum expended in the work for the first 10 years was never greatly over \$250,000, and when the magnitude of the plan is considered, it is obvious that such a vote as this was a mere drop in the bucket. But in 1866 the works were pushed on rapidly, and the expenditure became more liberal; till, on the 17th of June, 1899, the new har-bor was opened in form by Wilhelm, then King of Prussia, now Emperor of Germany. The opening was in form in every sense. It is true the basin, canal, and moles were constructed, but the harbor was yet dry land, or, at the most, mud, when thus formally opened. A British shipof-war, the Meteor, was present at the opening. Not being gifted with the capacity of vaulting over earthen dykes and progressing on dry land, she lay outside in the bay. The works continued to progress until the declaration of war between France and Germany in July of last year. At that date Wilbelmshaven was but a naval port in name. No German ship-of-war had ever steamed into its basin. It existed indeed, and the port had been opened, but only by the nod of a King. An earthern dyke still extended across its mouth between the moles, excluding the sea water wholly from the new port.

Sportly before the declaration of war a North German squadron, consisting of the König Wilhelm, the Kron-prinz, and the Prince Friedrich Carl, had come to Eugland, on its way professedly to a voyage to the Azores. The König Wilhelm had nine inches of fourness on its bottom, for there was no dry-dock in German waters where the monster ship could be berthed and cleaned Its speed was thus reduced from 14 to 84 knots. Its cylinders were on an old and obsolete principle. In coning through the Kattegat the Prince Friedrich Carl had broken; off two of the four fans of its scrow. But the squadron quitted Plymouth in July, nominally on the way to the Azores, yet with a forewarning of what was coming, with secret orders not to pass the Land's-End, and with a rendezvous given at the Start. An arise from the flagship put into Dartmouth without hoisting the North German flag. An officer ran up to London, saw Count Bernstorff, and came down again with dispatches. On the 18th of July the German squadron was in the mouth of the Jade, while the French and most of the rest of the world believed it quietly jogging across the Atlantic to the Azores. There were but three ships, not in the best condition for offensive joperations, and, looking at the strength of the other side, not calculated to inspire great confidence as regards defensive capabilities. The three ships lay across the mouth of the Bay of Jade, opposit to the island of Wangeroog, at the point where the chan-nel is narrowest and obstructed with banks. The protection of the Weser was tardily confided to 15 torpedo-boats, that of the Elbe to six torpedo-boats (ateau launches). The position seemed critical in the extreme. It is a well authenticated to the month of August last, there was not a single gun in position on the German cost of the North Sea for defensive purposes. If the French fleet, as might reasonably have been expected, had driven in the defenses constituted by the three iron clads at the mouth of the Jade, the works of Wilhelmshaven lay at their mercy, and there was no retreat for the German iron-clads, for the earthen dyke still stood across the throat of the harbor of Wilhelmshaven; and even if this had not been the case, it was in an utterly SEC. 7. If on or before the first day of November, 1873, the Commis-defenseless condition. How the French never came is now a matter of history. Meanwhile, extraordinary exertions were made to remedy the defenseless condition of the northern coast. Yet the batteries protecting the Eibe were not finished till October, and mounted with 600-pounder guns. Some little time before this a battery of 300-pounder guns was get into position at Wilhelms haven. Now, there are two batteries of guns of this caliber on either side of the entrance to the harbor. At Heppensertrift a large fort is in course of construction on a slight projection into the bay. Its easemates are now about to be arched in, and its searp s about finished. It will mount when finished-and no time is to be lost in its completion-about 40 11-inch guns, which will command the fair-way leading to the m of the harbor. Another fort on the opposite side of the bay-here about six miles across-is building, and an iron-clad fort is to be erected in the center of the channel. It is reckoned, and justly so, that these defenses combined with torpedoes and obstructions to be laid down in the fair-way in case of need, will render Wilhelmshaven impregnable on the sea-side, while a chain of earthwork redoubts on the landward side effectually

meet the minor danger in that direction. One of the defects of the place-that of want of good drinking water—Wilhelmshaven has overcome. Springs have been discovered, and water is now obtained, so that the tanks of the largest ship can be filled at once with good water. Another apprehension-viz.: that the chan-nel and harbor mouth were liable to become silted-is contradicted; and it seems probable that any tendency thereto may be averted by the steady use of dredgers, which certainly are not spared. In December last, taking advantage of a high tide, the König Wilhelm came in drawing about 30 feet of water. But Wilhelmshaven is surely, in the eyes of the German naval authorities themselves, far from the beau ideal of a harbor for a war-fleet. It is utterly deficient in aggressive facilities while it presents facilities of an obvious character, not for being attacked, it is true, but for being blockaded. Like all creek harbors, it is very much of the nature of a prison. There is a point in the passage out where the fair-way is not over half a mile broad. With a blockading squadron of very mod erate force concentrating a fire on a guiley like this, not to be traversed save by a single ship at once, a fleet in Wilhelmshaven, trying to come out, would simply be sent to the bottom ship after ship. Of course, these very defects in an aggressive sense enhance its merits in defensive one; but then it is a wrong application of the utility of a fleet to stow it away behind big land bat teries at the bottom of a gut, and imagine that a tri umph has been achieved when annihilation has been escaped. Such a port as Wilhelmshaven is just the port to nullify the boldest exertions on the part of the best fleet having it as a base of operations, providing always that a hostile fleet were prompt to take time by the fore-lock, and blockade the exit. The German coast of the North Sea is emphatically an ineligible coast in point of

nggressive facilities. The Prussian war navy handed over to the North Ger man Confederation and now become the imperial navy owes its initiation to Prince Adalbert, who is now the admiral commanding it. In the early days it was offi cered partly by officers of other nationalities, and by suitable men taken from the merchant navy. A naval school for training young officers was, however, very soon instituted, and for a long time none have been ad mitted into the navy except through its portals. following are the tests applied to a young officer to insure his efficiency. The entry of a cadet is admissable between the ages of 16 and 17; the applicant must come with a certificate that he has passed a nasium examination in the first class, and has in addition, to pass a stiff examination in arithmetic geography, trigonometry, stereometry, spherical trigo-nometry, physics (comprehending optics, acoustics, heat, electricity, magnetism, electro-magnetism, and induction), geography (physical and political), French and English languages, drawing; and when not educated in gymnasium, history and latin in addition. The as-piraut then serves for one year in the cadet-ship, when he goes up for his examination for the rank of midship-

man. The following are the subjects on which he has to satisfy by no (means lenient inquisitors: Navigation of ! astronomical geography, logwork, &c (technical and theoretical), taking solar, lunar stellar, and planetary observations; construction and use of charts; practical acquaintance with the use and construction of the sextant, barometer, ther mometer, symplesometer, chronometer, the deviation of the compass, &c.; seamanship in all its details, practical and theoretical; examination in artillery; knowledge of powders-their composition, explosive force, burning speed, and projectile power; ability to judge between good and bad powder; methods of proving powders; the stowage of powder in magazines, affoat and ashore transport of powder; classification and nomenclature of projectiles; acquaintance with their proper charges knowledge of guns, gun-carriages, and armor-plating knowledge of gunnery practice; with many other topics

of a more technical and intricate kind. The lad then goes affoat on service for two or thre years as midshipman, and then enters the Naval School at Kiel, where he studies for a year or a year and a half, at the end of which time he presents himself for his ex amination to pass from midshipman to lieutenant. This examination covers the same ground as the former, but is much more testing. He is probed to the bottom in navigation and seamanship, including tactics. Among the artillery subjects he is questioned as to the parabola in the flight of round shot and shell, the effects of impact with given materials, penetrating power of different projectiles, the probabilities of objective points, the details of foreign artillery armaments, and the use and effects of small arms in naval as tions. In paval engineering he must have a ful knowledge of machinery, including principles of sation, expansion, &c., and of shipbuilding in all its details. He must be up in land fortifications and the man euvers of an infantry force on shore. He must have full acquaintance with the regulations affecting discipline, and have the penal code (which is the same as that in orce among the German land troops) at his fingers' ends. He must be caccomplished in topographical draughtsmanship and in the construction of plans for batteries, and the impromptu defense of places. In mathematics he has to demonstrate familiarity with the differential and integral calculf. Having thus shown himself to be an Admirable Crichton, he is then liberty to wait for his vacancy as sublieutenant. When midshipman, he enjoys the daily pay of 40 cents on shore; affont, 50 or 65 cents extra as table noney. He must serve two years, at least, as sub-liet enant before promotion to lieutenant, but the average is from three to five years' service prior to the occur rence of a vacancy. After an average service of about six years as lieutenant, he becomes captain-lieutenant. At present this grade is attained without any additional examination, but it is intended to create an institution to be called the Naval High School, of a similar character with the Military Academy, attendance at which, for a certain time, is to be compulsory before the attainmen of the rank of captain-lieutenant. As captain-lieutenant the term of service may average about six years, the next grade being commander; the higher ranks are captain and admiras, the attainment to which is wholly dependent on the occurrence of vacancies.

Promotion is, without exception, by seniority; it being sumed, and surely not without cause, that efficiency is ecured in all by the rigorous examinations which have to be undergone. The naval service is, with the exception of the officers of the merchant service taken it into it at the beginning, and still remaining, wholly an aristo cratic one. It is the fashion to join the naval service, and it is at once compulsory and the fashion to pass good examinations in that service. It is an achievement, the secret of which the Germans seem alone of European nations to have mastered, how to make it the fashion with young noblemen to work, as he who worketh that he may live. On board a first rate vessel the following is the cadre of officers: 1st. Captain; 2d. Commander; 3d. Navigating Lieutenant (who is always a captain-lieutenant, and is the senior officer next to the commander); 4th. Gunnery Lieutenant (who is also senior officer of the watch), and two or three junior watchofficers (lieutenants), with the quantum of lieutenants. Under the navigating lieutenant there is no sailing master; the former is responsible for the sailing of the ship, and is aided by the best midshipmen on board. Simlarly, the gunnery lieutenant has no gunner under him but is responsible for all artillery details himself. It is noticeable how, by the test of seniority, greater stress seems to be laid upon navigation than gunnery; on the same principle, probably, that in a cavalry regiment the horses are always objects of greater solicitude than the Every ship in the German service, even the smallest gunboat, is provided with detailed drawings and sections of every foreign war ship. Its weak points are specifically stated, and details given as to the spots to aimed at with the most likelihood of disabling "My word," to quote the naise the machinery. remark of an officer with whom I happened to have conversation on this topic-" My word, I know the ships of the British fleet better than their own young officers." And I saw enough to make me certain that this was no empty boast. Every ship possesses accurate and detailed charts of the naval ports of the world; and the examination to which officers are subjected on this, as on other topics, insures their acquaintance with them, so that pilots, the want of which was one of the pitcous complaints of the French naval officers on the farcical northern cruise of their fleet, are capable, in emergency, of being dispensed with. "L'Orient is a very difficult is carried to New-York to make a white paint called zinepilot. Plymouth! there is not a lieutenant in the German navy who could not take a ship into Plymouth in the night time." This was what a naval officer quietly told me, with whom I happened to have a talk on mari time affairs in a Berlin restaurant, and his testimony is confirmed from other sources. It seems plain Germany and of a seaboard. The solution of the fleet problem is simple, if costly: the consideration of the other matter involves questions into which I do not feel called upon

One word about the seamen. They are drawn from the seafaring population in the same manner as the army is from the inland population, the term of service eing for three years. There are four classes. The first class, from which the petty officers are found, comes from a naval school, the pupils of which enter as boys, and are taught seamanship in youth. The term of service of this class is 12 years, after which they are pro vided for in various capacities in the civil service of the frown in the same way as long service non-commissions officers of the army. The pay of the first-class seaman is bout 30 cents per day, in addition to food and clothing It does not seem to be the custom to retain, while ships are not in commission, the services of any save these first-class men. At Wilhelmshaven ther are only about 200 sailors, who live in barracks on shore, and are all first-class men, in every sense of the word. Some difficulty might be experienced in getting together efficient crows for a fleet at short warning. It is not sufficient to have good seamen, such as the merchant service would furnish; it would seem to a nonprofessional man that some experience in the handling of great guns would be advantageous. It is not easy to see how they can be obtained with a scratch crew; nor is it easy to see how, if indiscriminate and unconditional dis charges are given when a ship is paid off, anything but a scratch crew can be got together on short notice, taking into consideration the long absences from home of so many seamen. Not the least interesting question affecting naval matters which the late war brought up was that of torpedoes. The opinion of those whose ex perience of them was largest is not favorable to the value of fixed torpedoes. It is impossible to be certain that they remain stationary. " You never know where they are," was the pithy remark made to me concerning those at the mouth of the Jade. Often they go adrift and get in a tangle in a single night, and they block the road for friends as well as foes. The best means for the application of torpedoes is judged to be by means of sats constructed specially as torpedo-boats, which in a single night can lay down a belt of torpedoes in a fleet's pathway, or a ring of them round a fleet, insuring the num of possibility of getting adrift. But my in formant's sententious summary was, "Torpedoes wi never supersede forts, ships, and big cannon, although they may help at a pinch."

Protests against the flagrant misuse of their charters by the railways in compelling people to take palace cars, whether they wish or not, are numerous. Here is one from a person who specifies pretty clearly where the abuse lies: "At Albany a train was made up of five drawing-room cars, and but one ordinary firstclass car. One hundred and forty ladies and gentlemen, holding tickets entitling us to first-class passage, were crowded into and around this only car prepared for us, which could not seat one-half of us. Upon our appeals to the officers of the train, we were indifferently told that there were plenty of seats in the drawing-room ahead. which we could occupy by paying for extra, \$1 to Syra-cuse, \$1 25 to Rochester, \$1 50 to Buffale, and \$3 to Chicago, and so on. Some 20 or more had to submit to these conditions, or not get a standing place upon the train ; and those who would not submit to the imposition, were told they might or could wait for the next train. Finally, when the officers found that the passengers were not likely to submit to this indignity and fraud attempted to be perpetrated upon them, at the very last moment another car was added to the train, which still was not adequate for nearly all."

THROUGH THE SOUTH.

MINES AND RAILROADS OF NORTH CARO-LINA GOLD HILL-SILVER HILL-GUILFORD MINES-NEW INDUSTRIES-VAST RAILROAD SCHEMES -COTTON TRANSPORTATION.

SALISBURY, N. C., June 25.-This place will Northern men and Southern Unionists were confined, where so many died, and whence A. D. Richardson and his companions escaped. Not a vestige of the old prisonpen remains, and a luxuriant growth of corn waves over the greater part of its site. This is an old town, founded long before the Revolution, and, like Charlotte and Hillsboro', boasts of a house, still standing, which was occupied by Cornwallis. I left the cars here to visit the gold mining region of the State. This place is nearer the center of the mining sec-

on, but the chief mining interests are at Charlotte

A slightly irregular line ranning from Weidon, N. C., to Columbia, S. C., will throw westward of it all the min-

eral wealth of the State. There is not a county west of

that line in which gold has not been found, and, in most

of the counties, mines exist which have yielded the pra-

tious metal in large quantities, and still pay handsoms

profits to parties working in a business-like manner.

Previous to the discovery of California, more than two-

thirds of the gold of the United States was obtained from North Carolina, and one mine alone has yielded over \$3,000,000. This is insignificant healds the Comstock all ver lode or California placers, but it was great in its day. Taking a buggy and horse at this place, with a fat little darkey for driver, I commenced a tour of the adjacent mining region. My sleepy-eyed darkey belief his looks, for he alternated between little cal-naps and sharp applications of the whip to his nag, and was, withal, out as rapid and vigorous a driver as one would care to travel with. It is more than probable that the cause of this was revealed in an occasional exclamation of "Gwine to give us that quarter when you gits thro' the trip-is you, boss?" At any rate, he slumbered and whipped until we reached Gold Hill: The mines at this point have been worked in all sorts of ways-worked for inerals, worked for sale, and worked for stock operations. The surface for miles has been pierced with holes, while on the immediate hills are immense piles of debris, which now yield as much gold as was originally taken from the ore. The works are now carried on by a Mr. Howes of New-York as a private business operation consequently he is making money. Then he car ries on his underground works by cooperation. He gives his miners a percentage of all he gets from the ore. It is a shrewd plan, which would not work in some mines, but does well here. The deep shaft, called Barnhardt, I found full of water, but the miners were at work at a shaft about 300 yards to the north. They are getting a handsome ore from a hard state, worth about \$20 a tun, of which about \$6 per tun is saved. The difficulty lies in the large amount of sulphuret of iron and the small grain of the gold. The machinery used is the Blake crusher, Chilian mill, and Burke rocker. No new fashioned machinery has over been of vaine. Roasting might be of use, but it has not been tried. From 1.100 to 1,500 pennyweights per week of gold have been extracted, and expenses are about \$500. Mr. Howes says he knows Gold Hill, that he lost money there before the war,

and no one can induce him to try fancy New-York ma-

chinery. I am inclined to think much of his success due to the cooperative idea, as it makes every miner a

sort of proprietor, and prevents the practice of stealing

nuggets, formerly very common

This mine and its immediate neighborhood, by the present slow mode, is producing something over \$10,000 per year. No man has ever failed to make money here who worked the mine as a business, and with the simple machinery above mentioned. On the other hand, hardly a single Wall-st. company has ever made any money from the mines. This is true of every other mine in the State. A gentleman told me that he sold a mine to a Northern company for \$20,000 cash and \$30,000 on bond and mortgage. They tore out his old machinery and put in \$50,000 worth of crushers, concentrators, &c. They did not get \$1 of gold per tup, and surrendered the property to him. He sold their machinery for old iron, put in Chilian mills and Burke rockers, worked the mine in a small, quiet way, and it was yielding him a profit of about \$20 per day. South of Gold Hill, in the Counties of Cabarrus, Mecklenburg, Union, and Stanly, have been valuable gold mines, and a few are still worked. Near Charlotte, the Stephen Wilson mine yields about \$2,000 per week of a quartz ore, which is crushed by stamps. In Montgomery County, 10 to 15 miles east of Gold Hill, are several placer mines and two good slate and quarts lodes. The copper amalgamating plate is used. Mr. Howes intends to try it at Gold Hill. The Hon. J. T. Cowles, Assay Superintendent at Charlotte, states the present yield of the gold mines of the State to be about \$500,000 per annum. North of Gold Hill in Davidson County is the Conrad Hill gold mine, said to be a very valuable property; but it has been in the courts for the last 15 years. The vein-stone is quartz. Near it is Silver Hill, at one time the most noted mine in America, it have ing furnished specimens of carbonates and phosphate of lead, of most superb character, for numbers of European cabinets. These were found near the surface, and it also yielded large quantities of gold and native silver. At about 100 to 150 feet it became a fine, crystalline, argen-tiferous galena heavily impregnated with sulphuret of zine. It is now worked to a depth of 700 feet, and the ore lead. The Superintendent, Capt. J. ore still yielded from \$15 to \$20 of gold and silver to the tun, but that no effort was made to save it. The mine was worked for lead by the Rebels during the war. The superintendent told me he was sending off 10 tuns per day, and paying out about \$500 per week for labor. One of the country tarmers said it kept their county up, and he wished a few more mines would be started. He made \$600 per year in hanling, and also carried on one of the neatest farms I have seen.

East of Silver Hill a copper ming is worked on a mall scale, and in Randolph County are three or four placer mines. On Deep River, in this county, I found a former correspondent of THE TRIBUNE hammering out superior quality of iron from some of the best ore in the world. He was as jolly, and good-humored, and as rough as a Western pioneer. In his vicinity are five cotton facories-small affairs, but very profitable. North of Randolph, in Guilford County, was once the most extensive mining sections of the State. There are dozens of gold mines represented to be in the county, which now only exist on paper in New-York. They yielded gold very well near the surface, but a little lower down they became copper mines. For procuring copper, several of these mines are now valuable—that is, eacy would be if there were any sale for low-grade sulphurets. The Garner and Gardiner mines are the only ones at work. The section we traveled through has iron of every grade and character; there are also zinc in abundance, lead and silver, copper, gold, soapstone, talc, feldspar, kaolin of superb quality, water-power almost unlimited, and vast untouched forests of oak, hickory, and some walnut trees. South of this section are the coal fields of Deep River, where work is just commencing; north of it are the oal fields of Dan River, where no work has ever been done. This section ships more than \$500,000 worth of dried fruit, and furnishes even Russia with ax-handles. Westward runs the Western North Carolina Rail-road, intended to pierce the Blue Ridge and form a connection at Chattanooga with the great Southern system of railroads and the Southern Pacific Railroad. For the ompletion of this road more than \$7,000,000 of Special Tax Bonds were appropriated by the State. It is well known they were not used for this purpose. It is now stated that the road is soon to pass into the hands of the Pennsylvania Central Railroad Company, They intend to complete it to Asheville, thence northward to Cumberland Gap, and also westward for Chattanooga. It is to be hoped they will persevere in this enterprise, as thus the shortest line from the cotton country to the ocean will be made, and a vast extent of fertile soil and now unknown mineral land beyond the Blue Ridge will be opened to the world.

On Saturday, 25 miles west of this place, a grand meet ing was held to celebrate the completion of a railroad from Charlotte to Statesville, with the title of Atlante, Tennessee and Onio Railroad. The road is about 50 miles long. Its gauge is five feet. The North Carolina Rallroad is of the four-foot-eight-and-one-half-inch gauge; at Greensbore, on the North Carolina Railroad, commet the Richmond, Danville and Greensboro Railroad, also a five-foot gauge. At Charlotte the present South Carell Railroad is five feet, and the Atlanta Air Line is also five feet; hence, there was a change of cars at Chariotte and at Greensboro, and there could be no competition for the feet; hence, there was a change of cars at Charlotte as at Greensboro, and there could be no competition for the transportation of cotton. The Pennsylvania Central Railroad Company owns these five-foot gauge roads, out has not yet been able to get control of the North Carolina not yet been able to get control of the North Carolina Railroad, so as to change its gauge to Greensboro; hence the construction of a parallel line. Fue Legislature the construction of a parallel line. Fue Legislature the construction of a parallel line. Fue Legislature above mentioned, and a new charter has been obtained to above mentioned, and a new charter has been obtained to above mentioned, and a new charter has been obtained to the Case of Swazy agr. The Treasurer of the State of the Case of Swazy agr. The Treasurer of the State has North Carolina, &c., in the U. S. Circhit Court, it has been decided that no dividends actualing on the been decided that no dividends actualing on the State, but must go to the payment of merest on to the State, but must go to the payment of merest on to the State, but must go to the payment of merest on to the State, but must go to the payment of merest on the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last Winter they refused to do, and if the stock, which last